ROOT and STORAGE CELLARS

BY

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DRAUGHTSMAN, CENTRAL EXPERIMENTAL FARM

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The storage of roots, and generally, of perishable farm products, is a question which is receiving considerable attention at the present time. Those types of storage which admit of fairly simple construction and comparative low cost are the ones to consider; while the choice of materials depends almost entirely upon local conditions.

The features which require careful consideration are:—

Ventilation.—Roots and vegetables mould and spoil very quickly if deprived of a circulation of air, so that the cellar must be so ventilated as to insure this air throughout every part of it. It will sometimes be an advantage to have the air drawn in at one end of the cellar and out at the other. This circulation of air may also be assisted by using slatted floors and wall linings or, better still, bins with slatted floors and sides; while certain vegetables, such as onions and cabbage, are kept better if stored on open racks. Temperature must also be considered in conjunction with ventilation; a temperature of approximately 38° F. will meet the requirements of almost all vegetables.

Moisture.—Earth floors are the only ones in which a proper and sufficient amount of moisture, for the preservation of vegetables, may be maintained.

Drainage.—Good drainage is absolutely essential for the proper preservation of the contents of the cellar. A sandy soil and high ground provide the ideal conditions; otherwise very careful drainage of the foundation is necessary.

Depth.—In level land it is sometimes difficult to secure good drainage in a deep cellar. Otherwise, the cellar may be any depth, except that the shallow cellar makes handling of roots and vegetables much easier than the deep cellar.

Any of the accompanying plans may be used for whatever depth is desired.

Location.—The isolated cellar should be, if possible, in a sheltered position near trees or shrubs, while a south entrance will admit of opening doors for admission of sun and air.

TYPES

Storage may be classified under four main heads, as follows:—

The Earth Pit.—This has been studied extensively in Exhibition Circular No. 57 of the Experimental Farms Branch, and is therefore not included here.

The Cellar under Barn Driveway—Type A.

The Cellar under a Building—Type B.

The Isolated Cellar—Type C.

Type A

THE CELLAR UNDER A BARN DRIVEWAY

The space under the driveway in a bank barn is often merely an earth fill; the utilization of this space as a root cellar is of great advantage to the farmer as it gives him storage space immediately adjacent to his barn and usually opening off his feed room. This cellar is not, of course, well adapted for vegetable storage, but

is purely for cattle feed. The cellar may also be found under the feed room, in which case the roof is flat and its construction more nearly resembles the isolated cellar.

The plans show a cellar 14 feet by 20 feet inside, with a storage capacity of 750 bushels, based on a depth of 5 feet (estimated at the rate of 1½ cubic feet per bushel). The walls are 12 inches thick and the ceiling or roof is a 5-inch thick slab with a 2-inch cement finish on top. The height of 9 feet 6 inches at the barn wall side should fit the average barn with a 9-foot ceiling.

Two methods of supporting the roof are shown: 1st, a concrete beam which is monolithic with the roof slab, and, 2nd, steel I-beams; many farmers would use old railroad rails, in which case two would be required instead of one I-beam. The first method may possibly be more difficult and expensive on account of the form work necessitated. Reinforcing steel must be used in the roof; ½-inch square bars 5 inches apart run across the cellar, while the same sized bars 24 inches apart run lengthwise. The concrete beam requires 4 bars, each ¾ inch square, 1½ inches from the bottom; around these are ⅜-inch steel stirrups, 24 inches apart, which are carried up and hooked over bars in the slab, as shown.

The walls and footings require a mixture of 1:2½:5, which is in the proportion of 1 bag of cement to 2½ cubic feet of sand and 5 cubic feet of crushed stone or gravel. In this mixture a bag of cement is considered a cubic foot. The roof and beam require a mixture of 1:2:4. The best way of proportioning the mixture is to make a bottomless measuring box, 1 foot high, 1 foot wide and 1 foot long, inside, holding 1 cubic foot. The 1:2½:5 mixture would then need 1 bag of cement, 2½ boxes of sand and 5 boxes of crushed stone or gravel. The 1:2:4 mixture would need 1 bag of cement, 2 boxes of sand and 4 boxes of crushed stone or gravel. The quantities given in the bill of materials show barrels of cement, each barrel holding 4 bags.

The natural mixture of bank sand and gravel is not recommended, as it is difficult to obtain the correct proportions of sand to gravel in this. The mixture of bank sand and gravel or "bank run" may easily be screened with a ¼-inch screen and then mixed again properly. A frame, 3 feet by 6 feet of 2-inch by 4-inch lumber, with a ¼-inch mesh screen tacked to it, is easily made and the materials will slide down it if it be placed at an agle.

The concrete cellar requires insulation of its walls and ceilings. Two methods are shown: studding and sheathing and the use of terra cotta tile for the walls. For the ceilings, furring strips may replace the studding, and 2-inch or book tile may replace the regular 4-inch tile.

CELLAR UNDER BARN DRIVEWAY (A)

Bill of Material

Walls and footings (back wall, of barn, not included), 23.7 cubic yards, mixture of 1:2½:5 requires:—

29 barrels (116 bags) cement,
11 cubic yards sand,
22 cubic yards stone or gravel.

Roof and beam, 8·12 cubic yards, mixture of 1:2:4 requires:—

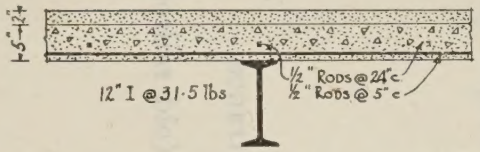
12 barrels (48 bags) cement,
3½ cubic yards sand.
7 cubic yards stone or gravel.

Reinforcement ½ inch square bars, 7 at 21 feet and 48 at 15 feet.
(Beam) ¾ inch square bars, 4 at 21 feet.

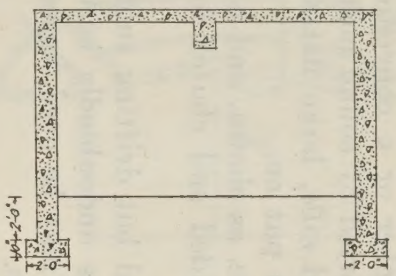
TYPE "A"

ROOT CELLAR UNDER BARN DRIVEWAY

SCALES — PLANS: 0 1 2 3 4 5 10 15 — DETAILS: 0 1 2 3



SLAB WITH TWO I BEAMS



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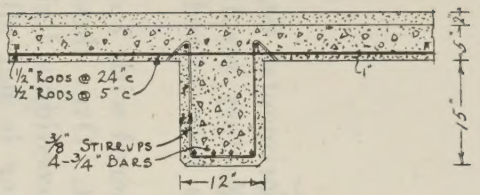
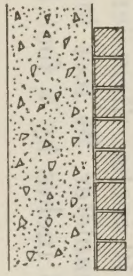


SLAB AND CONCRETE BEAM



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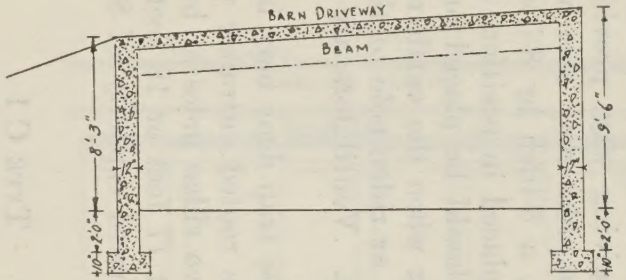

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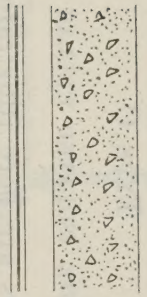

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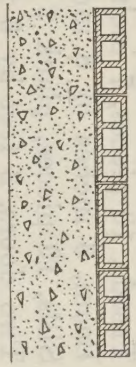
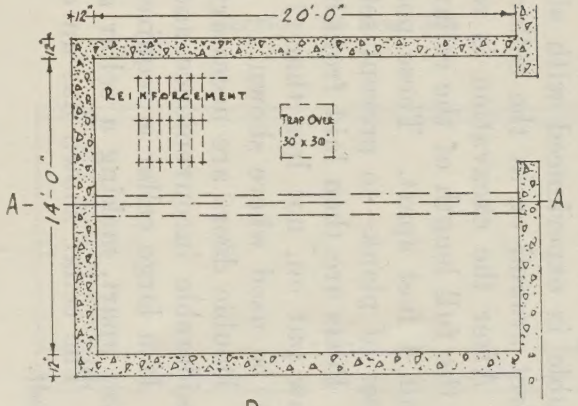
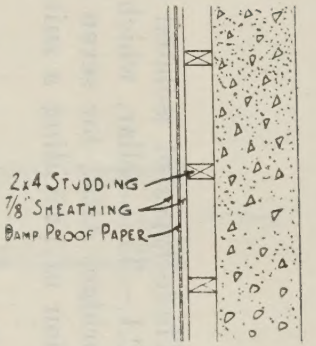


WALL INSULATION PLAN



PLAN



WALL INSULATION PLAN

Type B

CELLAR UNDER A BUILDING

This type so closely resembles the driveway or isolated cellar that very little reference to it is necessary. It is sometimes found under feed rooms in barns and frequently the ordinary house cellar is used. This is usually either too damp or too warm to serve as an ideal storage cellar, even when a portion be walled off.

Type C

THE ISOLATED CELLAR

Three types of isolated cellars are here illustrated.

C.I.—This cellar, which has been in use at Dominion Experimental Station at Lethbridge, Alta., for seven or eight years, has given very satisfactory results. The question of providing a suitable storage cellar at small cost has been solved in this case.

The excavation may be made about 5 or 6 feet deep and covered with 7 or 8-foot fence posts—ordinary split cedar ones—laid 5 to 7 inches apart. Over these is put earth and straw, as shown. In this climate, where rainfall is exceedingly light, little trouble is experienced with sides giving way, provided rainwater is not allowed to collect around or in the cellar; the sides may also be slightly battered.

After the excavation is made, a 6-inch by 8-inch timber or a convenient-sized log the full length of the cellar is placed in position, supported by sound posts placed about 4 feet apart. These posts should be placed on mud sills, large flat stones or pieces of plank—to prevent settling when the earth roof is put on.

Posts are then laid from beam or ridge pole to the side, as shown, and earth and straw put on, not less than 2 feet. Ventilators are provided and chutes for filling may be used where shown.

Double doors are necessary; the trap door may be used but drifting snow causes considerable inconvenience and the roofed entrance way is undoubtedly better.

If a large cellar is required, two ridge poles or beams may be used, spaced about 6 feet apart, making a cellar about 17 feet or 18 feet wide.

The cellar shown has an estimated capacity of 880 bushels, based on a depth of 5 feet.

Type C 1

BILL OF MATERIALS

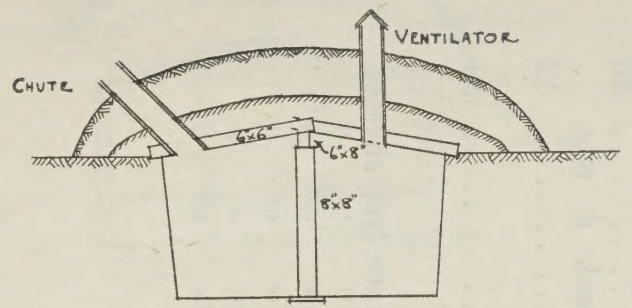
Posts, 10 pieces, 8 inches diameter, 6 feet 6 inches long.
Posts, 4 pieces, 6 inches diameter, 6 feet 6 inches long, for entrance.
Rafters, 56 pieces, 6 inches diameter, 7 feet long.
Treads, 10 pieces, 7 inches by 10 inches diameter, 7 feet long (old railroad ties).
Beam, 6 inches by 8 inches diameter, 24 feet long.
Sills, 10 pieces, plank 1 foot 6 inches by 1 foot 6 inches.
Two doors, 3 feet by 6 feet.

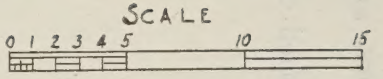
Type C 2

A slightly larger and more elaborate type than the previous one. This cellar has been in use at the Dominion Experimental Station at Rosthern, Sask., with great success for four years.

The illustration shows a cellar that may be built within the financial means of most farmers. The material used is such as is most easily available. Cedar posts and rough spruce lumber are suggested, but in districts where tamarac is plentiful,

TYPE C.1





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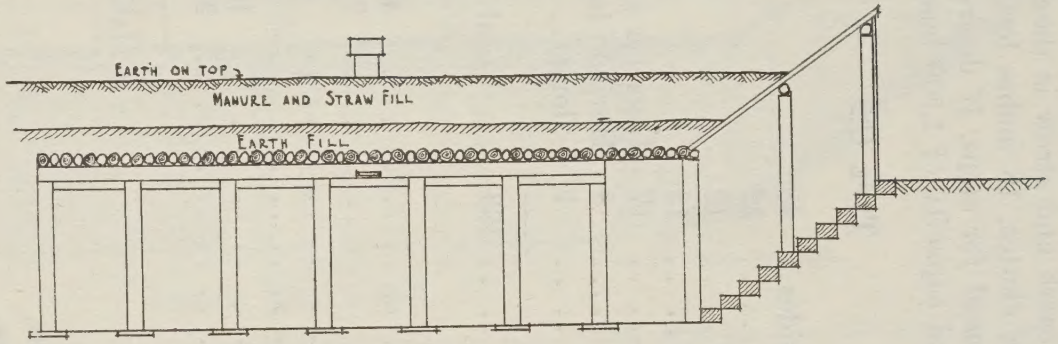
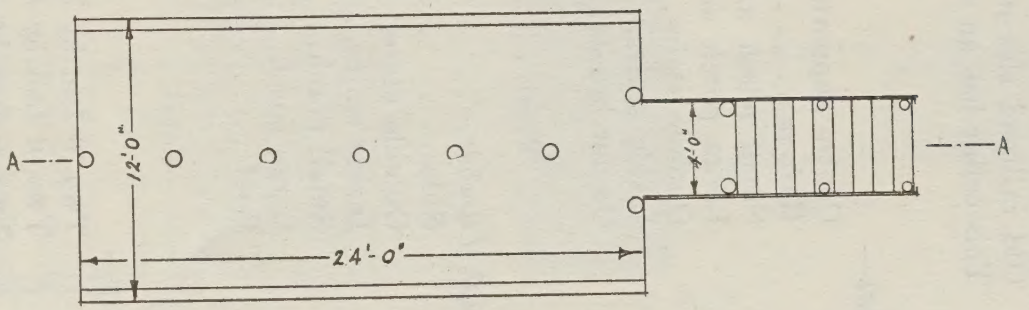


SECTION ON LINE A-A



PLAN

tamarac posts may be used instead of cedar and tamarac poles instead of spruce boards for the walls. The beams supporting the rafters are shown as railroad rails; and where these are easily obtainable at little cost, they are most satisfactory.

The plan shows an opening at both ends, one through a trap door into a barn and one through a porch into the open. The trap door is shown, for reasons previously stated.

The roof rafters are covered with rough boards spaced 5 to 6 inches apart, and metal roofing; the covering of earth and straw is then laid on. Ventilators are made of 6-inch glazed tile, and filling chutes, 18 inches by 18 inches, are provided.

Old railroad ties may be used for steps, if desired.

This cellar has an estimated capacity of 1,500 bushels, based on a depth of 5 feet.

Type C 2

Posts—

Centre supports and sides	48		
Rafters	32		
Small porch and roof	12		
Large porch and roof	12		
Outside stairs	17	Logs for stops	26
Inside stairs	8	Buried logs (each 6 feet long)	12
Corner braces	4		
Total	133	Total	38

Rough Lumber—

Sides	483	square	feet	surface
Outside stairs	244	"	"	"
Inside stairs	52	"	"	"
Small porch	83	"	"	"
Large porch	102	"	"	"
Roof	225	"	"	"
Total	1,189			

Doors—

Two, 6 feet by 30 inches.
Two, 6 feet by 48 inches.
Two, 6 feet by 36 inches.

Note.—Left door may be made of barn floor torn up.

Door Frames—

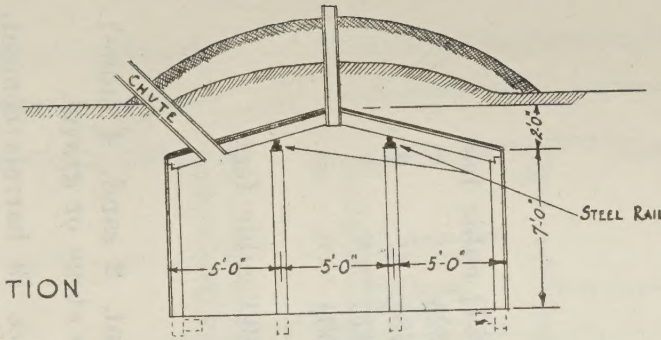
One, 6 feet by 5 feet.
Two, 6 feet by 4 feet.
Two, 6 feet by 3 feet.
One, 7 feet by 3 feet.

Metal for roof . . . . . 688 square feet surface
Tile . . . . . 3 glazed tile

Type C 3

The plans of the isolated concrete cellar show two methods of forming the roof —the plain roof and the use of the concrete beam and steel column. The latter would be necessary in the event of any weight being brought upon the roof, as would

TYPE C.2.



CROSS SECTION

SCALE

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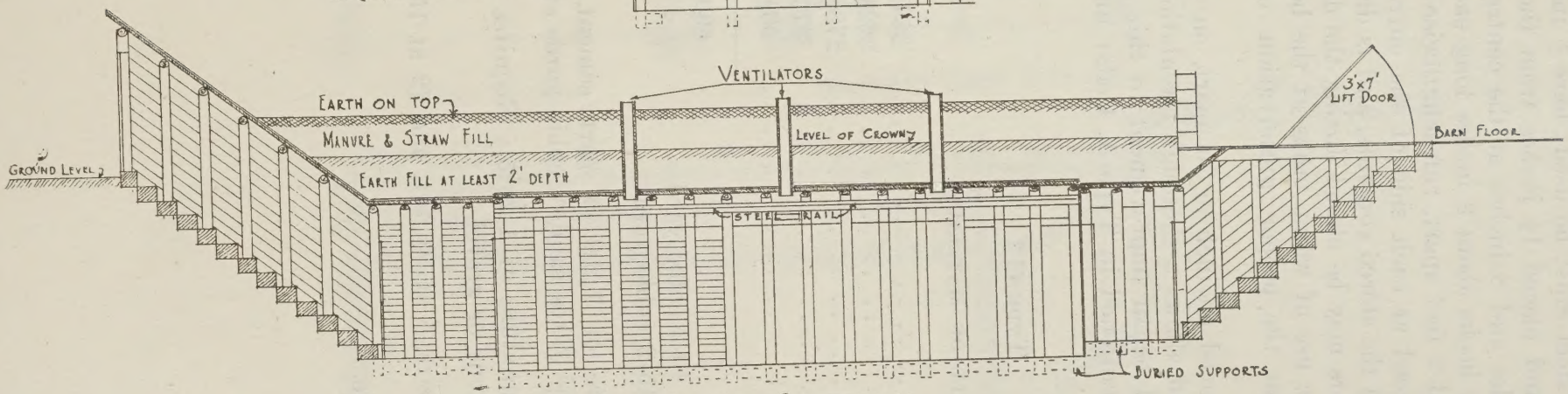
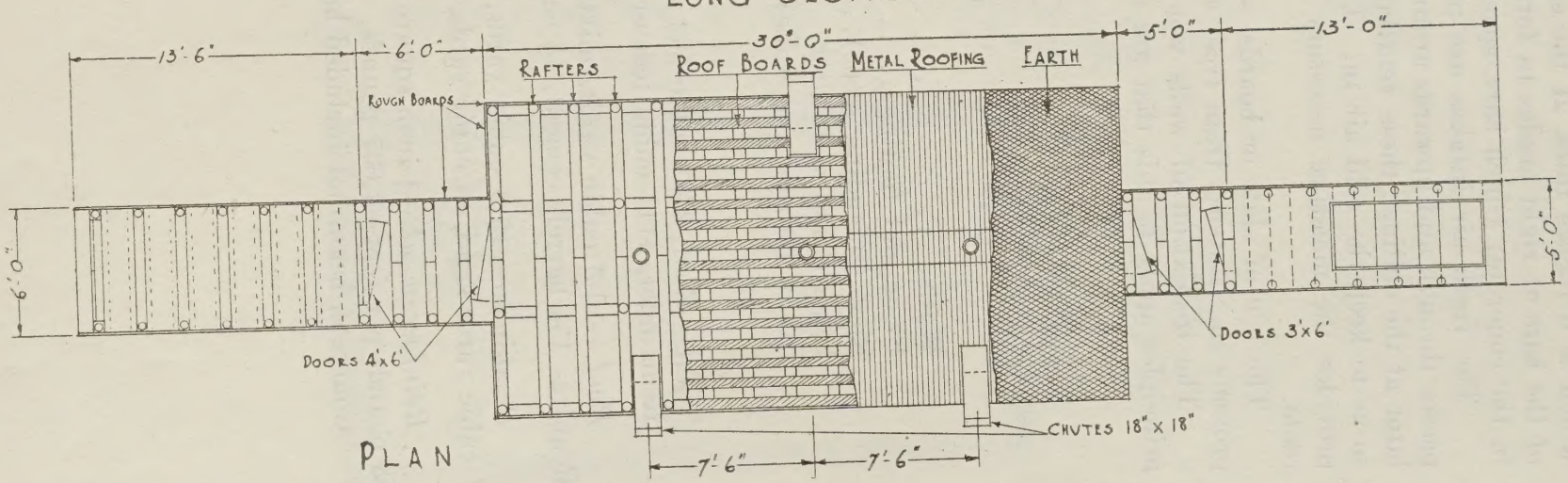


LONG SECTION



PLAN

be the case were the cellar used under a building. The roof might also be round or arched. The arched roof requires a 1:2:3 mixture and the flat roof a 1:2:4 mixture. (See Type A for explanation of mixtures and description of methods.)

For the flat roof, reinforcing steel must be used; bars ½ inch square are spaced 5 inches apart, centre to centre, and placed 1½ inches from the bottom of the slab, which is 6 inches thick at the sides and 8 inches at the centre. Bending the ends of the bars at right angles to form hooks about 3 inches long ensures good anchorage in the concrete; ½-inch bars, spaced 2 feet apart, run lengthwise in the cellar.

The fresh air intakes are placed at each side of the entrance so that the air passes through and upwards around the stored contents, and is drawn off by the ventilator at the ceiling; these ventilators may be closed during the day and warm nights, so as to keep the cold air in. The use of water tanks at the bottom of the intakes provides the moisture necessary for the proper preservation of the vegetables or roots.

The use of slats or boards, spaced an inch or so apart, on the walls and floors, protects the contents from frost and allows a thorough circulation of air.

The insulation of walls would be an improvement in this cellar and the same principles apply to this that are mentioned in Type A, Cellar under Barn Driveway.

Type C 3

BILL OF MATERIALS

Walls	283¾	cubic	feet
Floor and footings	262½	"	"
Roof (including steps)	278½	"	"
Intakes and ventilator	37	"	"
Stairs (treads and walls)	53½	"	"
	690	cubic	feet

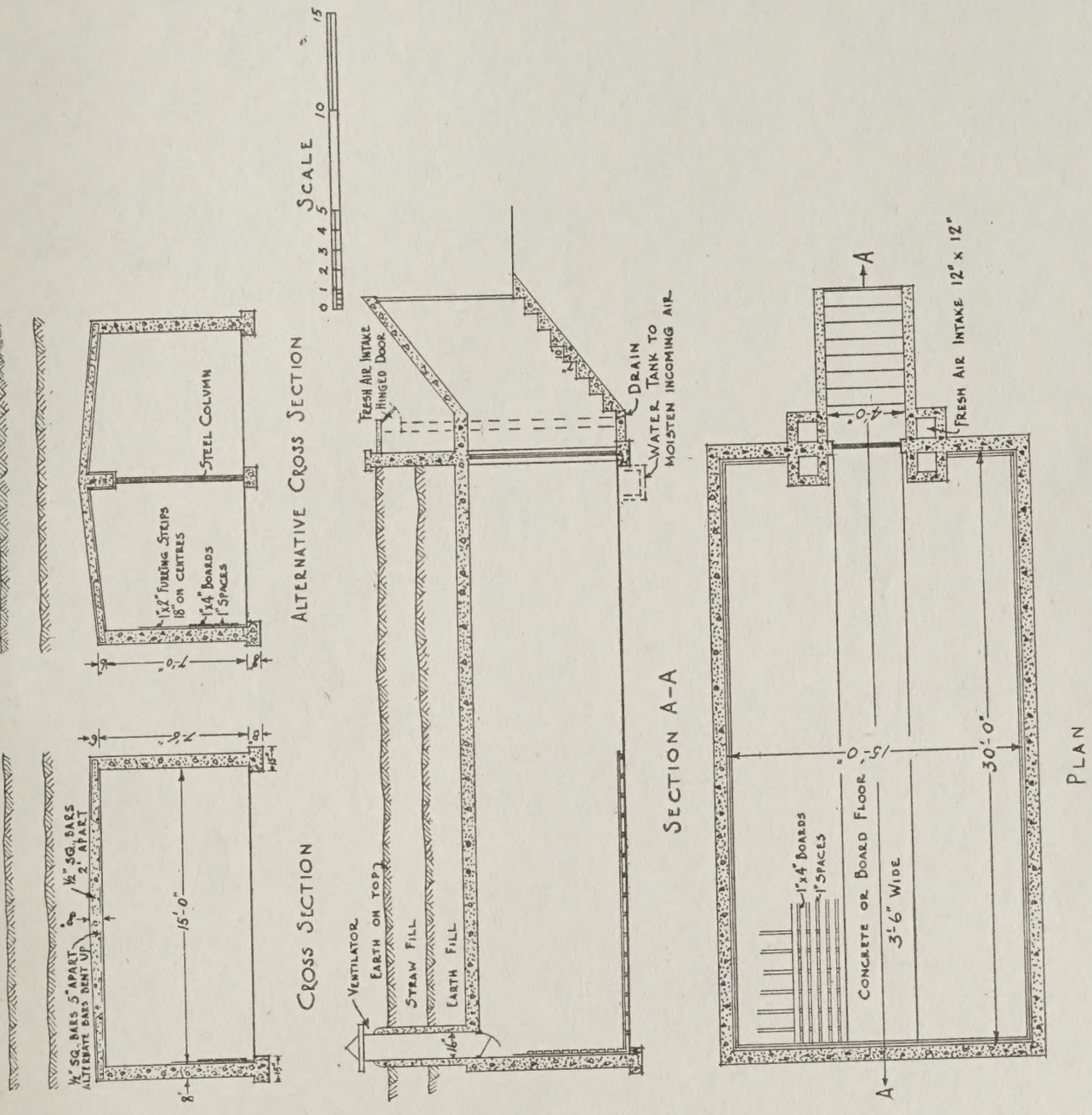
Total.—Roof, 278½ cubic feet or 10·3 cubic yards.
Remainder, 411½ cubic feet or 15·2 cubic yards.

Roof.—10·3 cubic yards, mixture of 1:2:4 (1 part cement, 2 sand, 4 stone). Requires 15½ barrels cement, 4½ cubic yards sand, 9 cubic yards stone or gravel.

Remainder—15·2 cubic yards, mixture of 1:2½:5. Requires 19 barrels cement, 7 cubic yards sand, 14 cubic yards stone or gravel.

Reinforcement.—½-inch square bars, 8 at 30 feet, and 72 at 15 feet; 1,220 feet at 85 pounds per foot—1,037 pounds.

Concrete, beam not included here.



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